Determining North American River Otter (*Lontra canadensis)* Population Density and Habitat Characteristics on the Slocan River, British Columbia

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Disclaimer

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ENVIRONMENT & GEOMATICS
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Abstract

North American river otters (*Lontra canadensis*) are elusive, semi-aquatic mammals that spend most of their time within aquatic ecosystems or on land-based shelters. The population density and habitat preferences of river otters in the West Kootenay region of the British Columbia Interior are not well understood. A better understanding of how habitat affects river otter occurrence can help predict areas of current and future occupancy, evaluate population trends and identify areas for management focus and restoration. Research projects on habitat characteristics and population distribution have been completed by Recreation, Fish, and Wildlife students of Selkirk College since 2011. Information has been gathered on presence/not detected, habitat preferences, and population density along the north aspect of the Slocan river and the south aspect at the confluence of the Slocan River and the Kootenay River. The intent of this project is to continue collecting data on river otter along the non-represented central reaches of the Slocan River and, together with previous research data, determine river otter population distribution and habitat characteristics. During the winter months of 2020 Cameron MacKinnon and I surveyed a nine kilometer stretch along both sides of Slocan River between Perry's bridge and Winlaw bridge. Our data is based on presence/non-detection survey methods, along with the collection of latrine samples to further analyze occupancy of river otter. Through our surveys, we observed plentiful evidence of river otter activity, including tracks, dens, latrines, slides and a sighting of river otters as well. I analysed the collected data and reviewed potential trends including the types of signs detected and the surrounding vegetation type, the relationship between river otter activity and a steep undercut bank which separated the shoreline from upslope anthropogenic features. I further analysed the degree of anthropogenic disturbance river otters may to tolerant and considered a comparison of Kootenay River, a regulated river, latrine habitat quality to the Slocan River, a nonregulated river, latrine habitat quality. Through our research we documented that the Slocan River provides favourable habitat characteristics to support river otters.

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1.0 Introduction

North American river otters (*Lontra canadensis*) are elusive, semi-aquatic mammals that spend most of their time within aquatic ecosystems (Crowely 2009). There are two important habitat characteristics river otters require: access to prey and shelter (Gallent 2009). As top predators of freshwater ecosystems, river otters are resourceful and prey upon a wide diversity of mostly aquatic vertebrates (Reid 1994). River otters, not physiologically adapted to maintain themselves in water at all times, need sites on land for resting, shelter, passageways, and for latrine sites (Reid 1994). Latrines, or communal scat and urine marking sites, are crucial for the study of habitat selection, distribution, and occupancy of river otters (Day 2015). Otters use latrine sites for olfactory communication, transferring information on territory boundaries and for social status ranking (Day 2015).

Research suggests that river otters prefer habitat close to the shoreline with substrate and morphology that would provide vegetation cover, burrowing ability for dens, and steep banks for quick access to water (Reid 1994). The species is also linked to shorelines that contain freshwater streams because they use these waterways to move between habitats (Gallent 2009).

Historically, the distribution of river otters ranges throughout North America and they are found in near-shore marine waters, coastal, and freshwater marshes, inland streams, rivers, lakes, and ponds in British Columbia (BC), specifically (Hatler 2003). River otters are yellow listed in BC meaning the species is secure and not at risk of extinction (B.C. Minist. of Environment 1997), however, river otters occupy only 33% of their historical range at present (Melquist and Hornocker 1983). The demand for otter hides, freshwater pollution, and habitat destruction are the main threats to river otters (Melquist and Hornocker 1983). A better understanding of how habitat affects river otter occurrence can help predict areas of current and future occupancy, evaluate population trends and identify areas for management focus and restoration (Mackenzie 2011).

The population density and habitat preferences of river otters in the West Kootenay region of the BC Interior are not well understood, although they are known to inhabit the riverways throughout the area. The Slocan River flows out of Slocan Lake between the Goat Mountain

Range and Valhalla Provincial Park in the Selkirk Mountains. The Slocan River runs 59 km south to the confluence with the Kootenay River between Castlegar and Nelson, BC (Figure 1). Historically, the river formed a major transportation link in the gold and silver mining eras in the 1890s (SVEDC 2019), and played an important role in the development in the West Kootenay region by means of transporting logs from the surrounding mountain ranges to sawmills to the developing southern regions (SVEDC 2019).

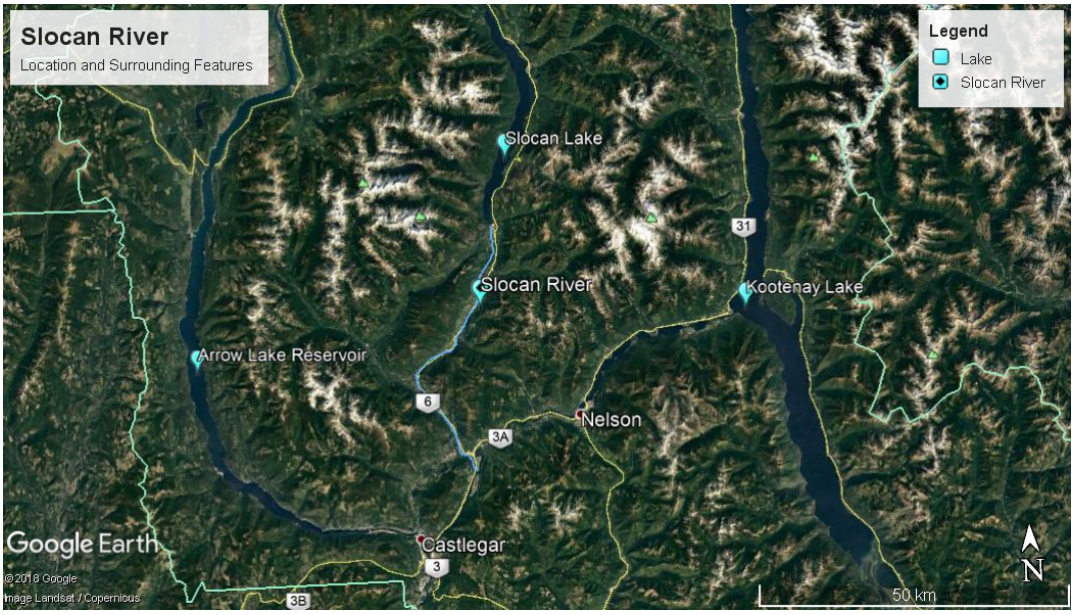

Figure 1. Slocan River, tributaries and surrounding natural and anthropogenic features, December 2019 (Google Earth).

The Slocan River watershed is a large river system with minimal anthropogenic effects. Hydroelectric development is completely absent on this river which is unique in the southern interior region (Monnier 2019). Because it is unregulated, the river can provide a great opportunity for scientific research as a control site and for habitat-based research projects (Monnier 2019). That said, disturbances of anthropogenic origin such as housing and road development and agricultural uses, common in rural residential areas such as the Slocan Valley, can have adverse effects on river otter habitat preferences and population (Gallent et al. 2009; Jeffress 2011). According to Gallent et al. (2009), river otters prefer sites with low levels of human activity but may occupy anthropogenic sites if food and shelter are available.

Recreation, Fish, and Wildlife (RFW) Program students at Selkirk College have collected river otter information within the West Kootenay region since 2011. This information has been given to the provincial wildlife managers at the BC Ministry of Forest, Lands, Natural Resource Operations and Rural Development (FLNRORD) (Mackenzie 2013). Information has been gathered on presence/not detected, habitat preferences, and population density along the north aspect of the Slocan river and the south aspect at the confluence of the Slocan River and the Kootenay River. There is a gap of river otter data in the central reaches of the Slocan River and my study will fill this knowledge gap by surveying the sections that have no representative data.

In this research study I will collect population and habitat data on river otters along central reaches of the Slocan River to contribute to a greater understanding of river otter habitat preferences in the West Kootenay region. To meet this goal, I will conduct the following objectives:

- Conduct research on river otter literature to better understand population and habitat characteristics.
- Determine population density of river otters by conducting presence/not detection sign surveys along an 8.7 km reach of the Slocan River shoreline.
- Determine habitat preferences by evaluating vegetation and shoreline substrate characteristics at sign locations.
- Assess anthropogenic influences at the local scale by comparing sign locations and proximity to anthropogenic disturbances.

2.0 Methods

2.1 Site description

The Slocan River Valley is characterized by a meandering river with mature black cottonwood (*Populus trichocarpa*) and western redcedar (*Thuja plicata*) riparian ecosystems (Monnier 2019). The river lies within the Interior Cedar Hemlock (ICH) biogeoclimatic zone, the northern and central portions of the river are within the ICHdw1 dry warm subzone, and the southern portions of the river lies within the ICHxw very dry warm subzone (MacKillop and Ehman 2016). The

river velocity varies due to large wood debris, log jams, and rock features which allow for many different types of shoreline habitat (Monnier 2019). Shoreline substrate included a mix of cobble and sand beaches, soft gravel banks, anthropogenic fields, and housing developments. Major tributaries are Lemon Creek (11U 464486mE, 5506131mN) and the Little Slocan River (11U 452785mE, 5489063mN) (Figure 1).

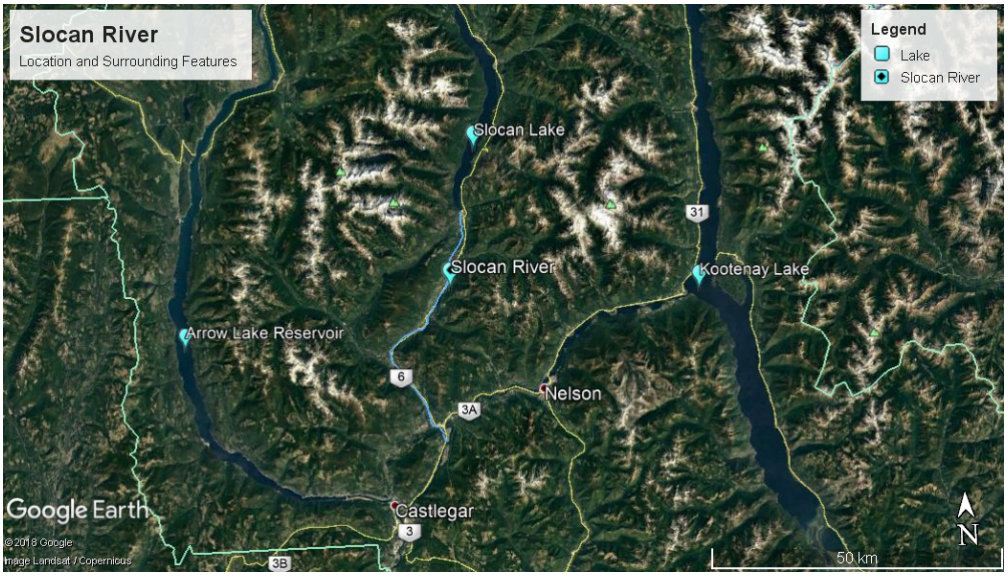

Figure 2. Slocan River, tributaries and surrounding natural and anthropogenic features, December 2019 (Google Earth).

Industry along the river is comprised of historical and present-day logging, mining, past railways systems, and active highway and road networks (Monnier 2019). The rural residential communities of Slocan City, Lemon Creek, Winlaw, Vallican, Slocan Park, Krestova, South Slocan, and Shoracres support an estimated 5,600 people within the Slocan Valley (SVEDC 2019).

The study area extends nine kilometers from Perry's bridge (UTM 463147mE, 5501461mN) south to the Winlaw bridge (UTM 459079mE 5496082mN) (Figure 2). This study area is comprised of rural residential housing development, agricultural fields, a recreational trail and the Winlaw Regional Nature Park.

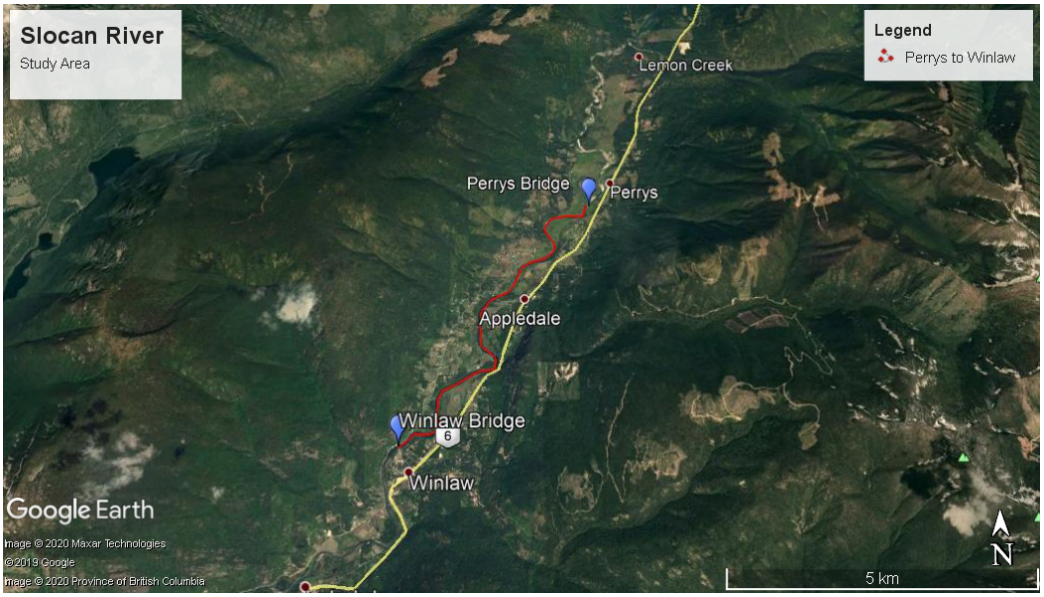

Figure 2. Slocan River study area from Perry's Bridge to Winlaw Bridge, January 2020 (Google Earth).

2.2 Data Collection

Currently, there are no provincial standards for river otter sign surveys (Gallent et al. 2009), however, in general, winter surveys are ideal since fresh snow allows for a greater amount of animal signs to be detected (Reid 1994). Data collection were completed with my research partner, Cameron Mackinnon, who is also a second year Recreation, Fish, and Wildlife student at Selkirk College.

There were four full-day surveys between January 1st, 2020 and February 15th, 2020, involving the west or east side of the river. Surveys were conducted to determine presence, abundance and location of river otter signs including tracks, feeding sites, latrine sites, slides, dens, and visual sightings. Digital photographs were taken of each sign location and the photographs were further analyzed to gain more information regarding habitat characteristics and river otter activity.

We traveled on the river via canoe, closely following the shoreline at a slow speed and scanning the shore for river otter signs. Once we found signs or when the shoreline was not clearly visible from the canoe, we conducted walking surveys on foot. We used a hand-held Garmin unit (GPS Map 60CSx) to map each sign location and documented habitat characteristics in our field book.

Habitat characteristics recorded at each sign include:

- location

- vegetation type such as plant species and cover (%)
- substrate type (silt, sand, gravel or cobble)
- sign location distance (m) from shoreline
- any anthropogenic influences or changes to the natural environment

2.3 Data Analysis

We collected feces samples from each latrine site in a Ziplock bag, and recorded the location using the GPS and field book. In a laboratory classroom at Selkirk College we examined the scat for scales, bones and hair samples as primary qualifiers for identification (Kootenay Otter Ecology Project 2014).

We compiled all the data into Microsoft Excel spreadsheets, verified each waypoint, and looked for errors or inconsistencies within our collected data. We further used this program to create tabular information to outline the relationships between habitat characteristics and specific sign types. Pivot table analysis was used to measure among the areas open vegetation, shrubs and mature trees. We used ArcMap 10.7, Geographic Information Systems (GIS) software, to analyze the location points of each river otter sign, comparing sign locations and anthropogenic features, visualizing preferred river otter habitat locations trends.

3.0 Results

Three river otters were viewed at midday from the canoe on February 9, 2020. The river otters were swimming two kilometres south of Perry's Bridge (Figure 3). We startled the river otters with our presence and once we were seen they began to swim north not exiting the water.

Figure 3. River Otter sighting, Slocan River, February 9, 2020 (Tiffany Muncaster)

Four full-day surveys for river otter signs were completed between January 14 and February 15, 2020. In that time there was consistent snowfall which provided adequate snow coverage of the ground allowing us to easily view wildlife signs. The majority of signs were ascertained on snow, with various tracks found in the silt and mud.

River otter signs detected included tracks, dens, latrines, slides, and sightings. A total of 44 signs were identified throughout the entire nine-kilometer length of the survey area on both the east and west shorelines.

Tracks (n = 30), the dominate sign type, were predominately found along the shoreline passing though streams and into den sites. Tracks were primarily found in areas with little to no vegetation (Figure 4). The tracks rarely lead away from the shoreline but, rather, ran alongside the river, crossing into and out of the waterline (Figure 5). When the tracks did lead away from the waters edge, they were often found passing through streams that had steep banks on either side (Figure 5).

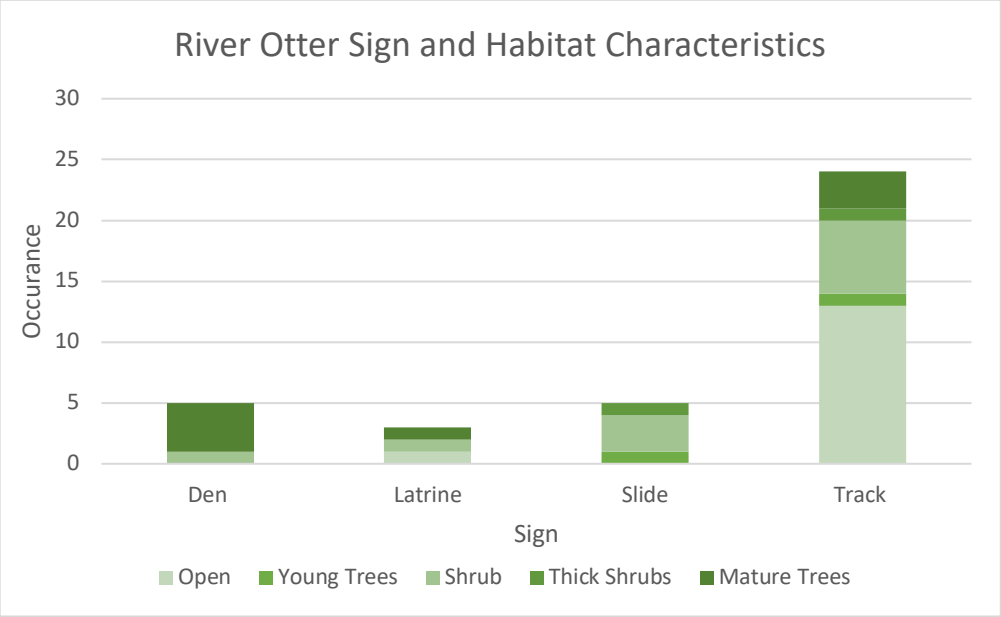

Figure 4. A comparison of River Otter sign by habitat vegetation type, Slocan River.

Figure 5. River Otter tracks along shoreline on Slocan River and leading through a stream, away from the Slocan River, January 24, 2020 (Tiffany Muncaster).

A total number of five den locations (11.3%) were found throughout the survey area. Dens were found in undercut, silt banks in 53% of the cases, they were located beneath large mature trees such as western redcedar (*Thuja plicata*), paper birch (*Betula papyrifera*) and western hemlock (*Tsuga heterophylla)* (Figure 6). Two dens sites (4.5%) were in close proximity to anthropogenic features (i.e. waterfront properties), the slope at both den sites was the steepest classification of 5 (40% +).

Figure 6. River Otter den site under mature vegetation, Slocan River January 24, 2020 (Tiffany Muncaster)

Three latrine sites (6.8%) were found in total, and each latrine location was on the water's edge with a steep bank less than a meter behind (Figure 7). Upon examination we did not find remains of prey or identifiable objects. The latrine samples did have a notable "fishy" smell, which relates to otter scat piles due to their primary diet of fish (Crowely 2009).

Figure 7. River Otter latrine site, Slocan River, January 24, 2020 (Tiffany Muncaster)

4.0 Discussion

Our research shows that the Slocan River provides good habitat for river otters. With the results from four river otter research projects, all completed by Selkirk College students, we have observed ample indications of river otter activity on both the Slocan and Kootenay rivers.

All river otter tracks were found along the shoreline many with a steep undercut bank which separates the shoreline from upslope fields and anthropogenic features, allowing for protected and likely quick movement between the terrestrial and aquatic environments. Gallant et al. (2007) found that river otters have been associated with steep banks and theorized that steep banks facilitated quick access to water.

Most of the tracks were found in areas with mature vegetation coverage, such as thick shrubs, or young trees (Figure 4), features that could help maintain good shoreline habitat. Jeffress et al. (2011) linked the amount of riparian woodland cover with the increased abundance fish, thus, providing river otters access to prey. We also observed that tracks often traveled away from the shoreline passing through frozen streams is also supported in the literature. River otters have been found to use freshwater streams as corridors connecting to water body to water body (Jeffress et al. 2011), again, as with the steep slopes, quick movement between terrestrial and aquatic environments appear to be a key survival strategy for river otter.

We found that most of the den sites were located underneath mature conifer trees and all the dens were dug into the silt bank within the root system of the trees. As Gallant et al. (2009) remarked, this type of vegetation structure offers cover along the riverbanks, the large root systems provide stability within the den structure, and a silt substrate allows for easy burrowing when creating a den.

An interesting trend was noticed between river otter den sites and anthropogenic features. The Slocan River, in general, has little human development, few heavily traveled roads, and no dams or hydroelectric generating stations. The river experiences relatively light use of the waterway; it is mainly used for recreation such as rafting, swimming, canoeing, kayaking and fishing. River otters are known to stay away from human development areas (Crowley 2009), however over half of the den sites we found were near rural residential development areas. The dens were found on steep banks often over 45 degrees, further supporting our conclusion that the bank feature was providing protection and separation from the anthropogenic activities. It appears that, on some reaches of the Slocan River, cohabitation between river otters and people can occur, a conclusion supported by Gallant et al. (2009) who stated that environmental factors such as habitat availability, prey and structure have larger a influence on river otter distribution than anthropogenic influences.

It may be that river otters have limits to the degree of anthropogenic disturbance they are willing to tolerant. At the southern end of our survey, closer to the Winlaw bridge, we found an inverse

relationship between the amount of river otter activity and the increase in human development density occurring in this part of the Slocan Valley (Figure 8). Similarly, Jared Maida (2011), in his report which analysed river otter activity and habitat on the south end of the Kootenay River, found that river otters tend to avoid heavily human populated areas, similar to the Winlaw area. According to Jeffress et al. (2001), river otters are consistently absent when human densities reached >183 people/km^2, the apparent threshold for human density tolerance. The latest census from 2016 places the Winlaw community at 400 people per 3.48km^2 (Statistics Canada 2016), or 115 people/km^2 below the tolerance level for river otter cohabitation according to Jeffress et al. (2001). The rural region surrounding Winlaw is comprised of good otter habitat, as we have found, this likely allows otters to disperse into a wider area and develop a lower human tolerance level.

Latrine sites are crucial in the study of habitat selection, distribution, and occupancy of river otters (Green 2015) they are social tools used to facilitate olfactory communication between individuals, transfer information regarding territorial boundaries, social status and reproductive state (Jeffress et al. 2011). These sites are closely linked to riparian cover comprised of large dense conifers with thick branches that provide horizontal cover (Crowely 2009), a finding that we also witnessed on the Slocan River. Furthermore, similar to tracks sites, all three latrine sites were found in connection to the steep bank along the shoreline, likely protecting activity and exposure. Dani Crowe (2018) reported evidence of river otter activity in the Slocan Pools area along the Kootenay River. The regulated Kootenay River, however, found that nearby hydroelectric activity may have restricted the quality and availability of river otter habitat as demonstrated through the lack of latrine sites (Crowe 2018). She discussed the potential relationship between water fluctuations and the lack latrine sites found during her survey period, stating that river otters may have had difficulty designating latrine sites along the variable shoreline due to the changing water levels clearing them away. The lack of quality habitat and latrine sites could have a negative affect in the river otter community dynamics. In contrast, the Slocan River, a non-regulated river, appears to have good habitat quality for establishing latrine sites as multiple sites were observed along the Slocan River by both Mackenzie (2013) and us in 2020.

5.0 Limitations

A major limitation of this study is the lack of provincial standards for river otter sign surveys; standardized survey methods would allow for increased consistency, efficiency, and compatibility when studying river otter ecology. Another limitation of this study is the Slocan River variability, access and travelling hazards such as log jams and class three rapids create safety hazards that could result in an incident. Route planning should be taken seriously when designing survey transects. An additional limitation in this project is the inconsistency of winter tracking. Sufficient snow coverage is needed to accurately identify wildlife signs, however, too much snow coverage will cover up all sign indications. I recommend that weather observations should be included as a project variable in future research.

6.0 Conclusion

Our project builds upon the ongoing collection of evidence of an active community of river otters on two rivers within the West Kootenay region. Through our research we documented that the Slocan River provides favourable habitat characteristics to support river otters, which are currently cohabiting the rural residential area with anthropogenic features.

Acquiring species-specific ecological knowledge in altered landscapes will improve the effectiveness of management and conservation activities wildlife species such as river otters (Gallant 2007). Our research aids in the development of provincial survey standards, river otter conservation and habitat restoration by supporting the creation of a reference model for river otter habitat preferences. A habitat reference model is an ecological simulation demonstrating ideal environmental features for river otters. Using our collected habitat preferences, it can create a framework to calculate potential areas of usable habitat for river otters. Once completed, the model can be used to estimate potential conservation areas that fit the criteria for ideal river otter habitat.

7.0 Acknowledgments

I would like to thank several individuals for assisting and guiding me to complete this research project. Firstly, I would like to thank Dr. Brenda Beckwith the Applied Research instructor in the School of Environment and Geomatics at Selkirk College, her continuous encouragement, instruction and support guided me throughout the entire project. Dr. Lui Marinelli, who is a wildlife biologist and an additional instructor in the School of Environment and Geomatics with expertise in terrestrial mammals. I would also like to thank Valerie Huff a Data Analyst Trainer, her amazing excel skills assisted me in the creation of the tubular data. Finally, I would like to thank my fellow Recreation, Fish and Wildlife classmate Cameron Mackinnon for venturing out with me and collecting data down the half-frozen Slocan River.

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